

What is claimed is:

1. An exposure method for exposing one of a first object and a second object with an exposure light beam passing through the other of the first object and the second object by using an exposure apparatus provided with an airtight stage chamber in which a movable stage is provided, the exposure method comprising:

importing the second object into the stage chamber;

adjusting a position of the second object with respect to the movable stage in the stage chamber;

installing, on the movable stage, the second object which has been adjusted;

moving the movable stage to adjust the position of the second object with respect to an exposure position; and

exposing one of the first object and the second object with the exposure light beam passing through the other of the first object and the second object.

2. The exposure method according to claim 1, wherein the exposure apparatus includes a transport system which imports the exposure objective into the stage chamber, and an airtight transport chamber which accommodates the transport system; a space between the stage chamber and the transport chamber is substantially isolated from outside air; a gas, through which the exposure light beam is

transmitted, is supplied into the stage chamber and the transport chamber; and management is made so that an allowable value of a concentration of an impurity in the gas is higher in the transport chamber than the stage chamber.

3. The exposure method according to claim 1, wherein:

the exposure apparatus includes another movable stage which is different from the movable stage, and another airtight stage chamber which is different from the stage chamber and which accommodates the another stage; and

the exposure method further comprises importing the first object into the another stage chamber; adjusting a position of the first object with respect to the another movable stage in the another stage chamber; installing, on the another movable stage, the first object which position has been adjusted; and moving the another movable stage to adjust the position of the first object with respect to the exposure position.

4. The exposure method according to claim 1, wherein the stage chamber and the movable stage of the exposure apparatus are incorporated into the exposure apparatus in accordance with a module system.

5. The exposure method according to claim 1, wherein the first object is a mask on which a pattern is formed, and the second object is a substrate to which an image of the pattern is transferred.

6. An exposure method for exposing one of a first object and a second object with an exposure light beam passing through the other of the first object and the second object, the exposure method comprising:

transporting the second object to a movable stage by the aid of a transport system;

adjusting a position of the second object with respect to the transport system on a contour basis during the transport of the second object to the movable stage by the aid of the transport system; and

exposing one of the first object and the second object transported to the movable stage with the exposure light beam passing through the other of the first object and the second object.

7. The exposure method according to claim 6, further comprising adjusting a position of the second object with respect to the movable stage to place the second object on the movable stage after the positional adjustment with respect to the transport system; and adjusting of the second object placed on the movable stage with respect to

the exposure light beam on the basis of a positional adjustment mark formed on the second object.

8. The exposure method according to claim 7, wherein the positional adjustment for the second object with respect to the transport system or the movable stage is performed on a contour basis of the second object.

9. The exposure method according to claim 6, wherein the first object is a mask formed with a pattern, the second object is a photosensitive substrate to which the pattern is transferred, and temperature adjustment is performed for the second object during a period between the positional adjustment for the second object with respect to the transport system and positional adjustment for the second object with respect to the movable stage.

10. The exposure method according to claim 6, wherein the movable stage is incorporated into an exposure apparatus in accordance with a module system.

11. An exposure apparatus for exposing one of a first object and a second object with an exposure light beam passing through the other of the first object and the second object, the exposure apparatus comprising:

a movable stage which moves the second object;

a stage chamber in which the movable stage is accommodated;

a transport system which transports the second object into the stage chamber;

a first alignment system which adjusts a position of the second object with respect to the movable stage in the stage chamber; and

a second alignment system which adjusts the positional adjustment of the second object installed on the movable stage with respect to an exposure position.

12. The exposure apparatus according to claim 11, wherein:

the first alignment system includes a contour-detecting system which detects position information on a contour of the second object; and

the second alignment system includes a mark-detecting system which detects position information on a positional adjustment mark on the second object.

13. The exposure apparatus according to claim 11, wherein the transport system includes a third alignment system which adjusts the position of the second object on a contour basis.

14. The exposure apparatus according to claim 11,

further comprising a temperature control system which controls temperature of the second object and which is arranged on a transport passage for the second object to be transported by the transport system.

15. The exposure apparatus according to claim 11, wherein:

the first alignment system further comprises an importing first arm and an exporting second arm; and

each of the first and second arms has a holding section which is slidable in a movement direction of the movable stage.

16. The exposure apparatus according to claim 11, wherein:

the second object includes a first substrate and a second substrate, and the movable stage has a first movable stage which moves the first substrate and a second movable stage which moves the second substrate; and

the first alignment system includes an alignment system for the first movable stage and an alignment system for the second movable stage, and the second alignment system includes an alignment system for the first movable stage and an alignment system for the second movable stage.

17. The exposure apparatus according to claim 11,

further comprising:

a transport chamber which accommodates the transport system;

a cover member having flexibility which substantially isolates, from outside air, a space between the stage chamber and the transport chamber; and

a gas supply unit which supplies, into the stage chamber and the transport chamber, a gas through which the exposure light beam is transmitted.

18. The exposure apparatus according to claim 17, further comprising an oxygen concentration sensor arranged for at least one of the stage chamber and the transport chamber.

19. The exposure apparatus according to claim 15, wherein a holder which holds the second object is provided on the movable stage, and the holder has a cutout which is formed corresponding to the holding section of the arm.

20. The exposure apparatus according to claim 11, further comprising a support plate for the second object, wherein when the second object is exported, then the movable stage, on which the second object is placed and which is moved, is suddenly stopped, and thus the second object is exported onto the support plate.

21. The exposure apparatus according to claim 11, further comprising a holding ring which includes pawls for holding the second object at predetermined spacing distances, and a transport arm which supports and transports the holding ring.

22. The exposure apparatus according to claim 11, wherein the stage chamber and the movable stage are incorporated into the exposure apparatus in accordance with a module system.

23. An exposure apparatus for exposing one of a first object and a second object with an exposure light beam passing through the other of the first object and the second object, the exposure apparatus comprising:

a movable stage which adjusts a position of the second object; and

a transport system which transports the second object onto the movable stage, wherein the transport system includes:

a handling mechanism which has two or more degrees of freedom of displacement for incorporating the second object from the outside;

a contour-detecting system which detects position information on a contour of the second object held by the



handling mechanism; and

an arm mechanism which has at least one degree of freedom of displacement for transporting the second object delivered from the handling mechanism in a direction toward the movable stage.

24. The exposure apparatus according to claim 23, wherein:

the handling mechanism includes a rotary stand, a first hand which is rotatably fixed on the rotary stand, and a second hand which is rotatably provided at a tip of the first hand and which has its tip at which the second object is held; and

the arm mechanism includes an arm which holds the second object, and a driving unit which drives the arm in a direction toward the movable stage.

25. The exposure apparatus according to claim 23, further comprising a temperature control system which adjusts temperature of the second object delivered from the handling mechanism.

26. The exposure apparatus according to claim 23, further comprising:

an airtight stage chamber which accommodates the movable stage; an airtight first transport chamber which

accommodates the handling mechanism; and an airtight second transport chamber which accommodates the arm mechanism, wherein:

closable openings are formed respectively between the second transport chamber and the stage chamber, between the first transport chamber and a transport line for the second object, and between the first transport chamber and the second transport chamber.

27. The exposure apparatus according to claim 26, wherein the opening formed between the second transport chamber and the stage chamber is smaller than the opening formed between the first transport chamber and the second transport chamber.

28. The exposure apparatus according to claim 26, further comprising, in the second transport chamber, a temperature control unit which adjusts temperature of the second object.

29. The exposure apparatus according to claim 23, wherein the movable stage is incorporated into the exposure apparatus in accordance with a module system.

30. An exposure method for exposing a second object with an exposure light beam passing through a first object,

the exposure method comprising:

measuring a position of a second substrate as the second object in a second area including an alignment position, concurrently with performing positional measurement and exposure for a first substrate as the second object in a first area including an exposure position;

moving the second substrate to the first area so that the first substrate and the second substrate are exchanged with each other; and

performing positional measurement and exposure for the second substrate.

31. An exposure apparatus for exposing a first substrate and a second substrate with an exposure light beam passing through a first object, the exposure apparatus comprising:

a first movable stage on which the first substrate is placed;

a second movable stage on which the second substrate is placed;

a first measuring system which performs positional measurement for the first movable stage or the second movable stage in a first area including an exposure position;

a first driving system which drives the first movable

stage or the second movable stage in the first area;

a second measuring system which performs positional measurement for the first movable stage or the second movable stage in a second area including an alignment position;

a second driving system which drives the first movable stage or the second movable stage in the second area; and

a stage exchange system which exchanges at least a part of the first movable stage and at least a part of the second movable stage with each other between the first driving system and the second driving system.

32. The exposure apparatus according to claim 31, further comprising:

a projection system which projects a pattern on the first object onto the first substrate or the second substrate; and

a mark-detecting system which detects a position of a positional adjustment mark on the first substrate or the second substrate, wherein:

the first measuring system performs the positional measurement for the first or second movable stage on the basis of the projection system; and

the second measuring system performs the positional measurement for the first or second movable stage on the basis of the mark-detecting system.

33. The exposure apparatus according to claim 31, wherein the second measuring system includes an interferometer which radiates a measuring beam onto the first or second movable stage through a space between the projection system and the mark-detecting system.

34. The exposure apparatus according to claim 31, wherein the stage exchange system is composed of an electromagnet which is installed to in at least one of the first and second movable stages and the first and second driving systems.

35. The exposure apparatus according to claim 31, further comprising first and second movable exchange tables which place the first movable stage and the second movable stage respectively.

36. The exposure apparatus according to claim 31, wherein the first measuring system and the second measuring system include interferometers, and movement mirrors of the interferometers are provided at opposing ends of the first and second movable stages.

37. The exposure apparatus according to claim 31, wherein at least a part of the first or second measuring

system is provided between the first area and the second area.

38. The exposure apparatus according to claim 31, further comprising a movable base on which the first movable stage and the second movable stage are slidably placed by the aid of air bearings; and a base plate on which the movable base is slidably placed by the aid of an air bearing.

39. The exposure apparatus according to claim 38, wherein the movable base satisfies the law of conservation of momentum with respect to the first movable stage and the second movable stage when the first movable stage and the second movable stage are moved on the movable base.

40. An exposure apparatus for exposing a second object with an exposure light beam passing through a first object, the exposure apparatus comprising:

a movable stage which positions the second object;

a projection system which projects an image of a pattern on the first object onto the second object;

a mark-detecting system which detects a position of a positional adjustment mark on the second object; and

a first measuring system which is arranged integrally with the mark-detecting system and which measures a

position of the movable stage in a predetermined direction on the basis of a reference object.

41. The exposure apparatus according to claim 40, wherein:

the reference object is the projection system; and

the exposure apparatus is provided with a second measuring system which is arranged integrally with the mark-detecting system and which measures a position of the movable stage in a direction intersecting the predetermined direction on the basis of the mark-detecting system.

42. The exposure apparatus according to claim 41, wherein:

the second object includes a first substrate and a second substrate, and the movable stage includes a first movable stage which moves the first substrate and a second movable stage which moves the second substrate;

the mark-detecting system includes detectors for the first and second movable stages respectively; and

the first measuring system includes measuring units for the first and second movable stages respectively.

43. The exposure apparatus according to claim 41, wherein each of the first measuring system and the second measuring system is an interferometer based on a double-

pass system.

44. The exposure apparatus according to claim 43, wherein a measuring beam, which is radiated from the interferometer of the first measuring system or the second measuring system, is radiated onto a position at the same height as that of the second object placed on the movable stage.

45. An exposure apparatus for exposing a second object with an exposure light beam passing through a first object and a projection system, the exposure apparatus comprising:

at least one vibration-preventive pedestal;

a base member which is supported on the vibration-preventive pedestal;

a movable stage which is slidably placed on the base member and which moves the first object;

a detecting system which detects relative displacement between the base member and the projection system; and

a control unit which controls the vibration-preventive pedestal on the basis of a result of detection obtained by the detecting system.

46. The exposure apparatus according to claim 45, wherein the detecting system is an interferometer unit



including a reflecting mirror which is arranged on an upper surface of the base member, and a reference mirror which is supported by the projection system.

47. The exposure apparatus according to claim 45, wherein the vibration-preventive pedestal is an active type vibration-preventive pedestal.

48. An exposure apparatus for exposing a second object with an exposure light beam passing through a first object and a projection system, the exposure apparatus comprising:

a base member;

a movable stage which is movably placed on the base member and which drives the second object;

a stage chamber which accommodates the movable stage;

a support plate which is arranged on the base member via at least one vibration-preventive pedestals and which supports the projection system; and

a detecting system which detects relative displacement between the stage chamber and the projection system, wherein:

the vibration-preventive pedestal is controlled on the basis of a result of detection obtained by the detecting system.

49. The exposure apparatus according to claim 48, wherein the detecting system is an interferometer unit which includes a reflecting mirror provided on an upper surface of the stage chamber and a reference mirror supported by the projection system.

50. The exposure apparatus according to claim 48, wherein the vibration-preventive pedestal is an active type vibration-preventive pedestal.

51. An exposure apparatus for exposing one of a first object and a second object with an exposure light beam passing through the other of the first object and the second object, the exposure apparatus comprising:

a projection system which projects an image of one of the first object and the second object onto the other;

a movable stage which drives the second object;

a stage chamber which accommodates the movable stage;

a first interferometer at least a part of which is provided in the stage chamber and which detects position information or velocity information on the movable stage; and

a second interferometer which detects displacement between the projection system and the part of the first interferometer provided in the stage chamber.

52. The exposure apparatus according to claim 51, further comprising another movable stage which drives the first object; another stage chamber which accommodates the movable stage for driving the first object; a third interferometer at least a part of which is provided in the another stage chamber and which detects position information or velocity information on the another movable stage; and a fourth interferometer which detects displacement between the projection system and the part of the third interferometer provided in the another stage chamber.

53. A method for producing a device, comprising a step of transferring a mask pattern onto a workpiece by using the exposure method as defined in claim 1.

54. A method for producing a device, comprising a step of transferring a mask pattern onto a workpiece by using the exposure method as defined in claim 6.

55. A method for producing a device, comprising a step of transferring a mask pattern onto a workpiece by using the exposure method as defined in claim 30.